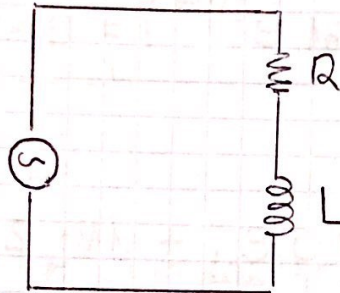


# GUÍA 9 - CORRIENTE ALTERNIA

①



$$R = 400 \Omega$$

$$L = 1 \text{ H}$$

$$V_G = 311 \cos(100\pi t)$$

4. CALCULAR  $i(t)$

$$E(t) = I(t) Z_T$$

$$Z_T = Z_R + Z_L$$

$$Z_T = R + j(\omega L)$$

$$Z_T = 400 \Omega + j(100\pi \cdot 1)$$

$$Z_T = 400 + 314,2 j \rightarrow \text{LO ESCRIBO DE MANERA } e$$

$$V_G = \varepsilon_0 e^{j\varphi_0} = 311 e^{j0}$$

$$V_G = 311 \text{ V}$$

$$Z_T = 508,6 \cdot e^{j\varphi_z}$$

$$\varphi_z = \tan^{-1} \left( \frac{314,2}{400} \right)$$

$$\varphi_z = 0,66$$

$$Z_T = 508,6 e^{j0,66}$$

$$E = I Z$$

$$311 \text{ V} = I (400 + 314,2 j)$$

$$311 \text{ V} = I (508 e^{j0,66})$$

$$I = \frac{311}{508 e^{j0,66}} = 0,61 e^{j0,66} \text{ A}$$

$$I = 0,61 \cos(0,66) + j 0,61 \sin(0,66)$$

$$I = 0,48 \text{ A} - j 0,37 \text{ A}$$

**B.** LA CAIDA DE TENSION  $V_R$  Y  $V_L$ .

$$\bullet V_R = Z_R I = R I$$

$$V_R = \overset{400 \Omega}{R} (0,48 - j 0,37)$$

$$V_R = 192 - 148 j \text{ V} \rightarrow 400 \cdot (0,61 e^{j 0,66}) = 244 e^{j 0,66}$$

$$\bullet V_L = Z_L I = j(\omega L) I$$

$$V_L = 100 \pi j (0,48 - j 0,37) = 150,8 j + 116,2$$

0 TMB

$$Z_L = 314,2 j = 314,2 e^{j 1,56}$$

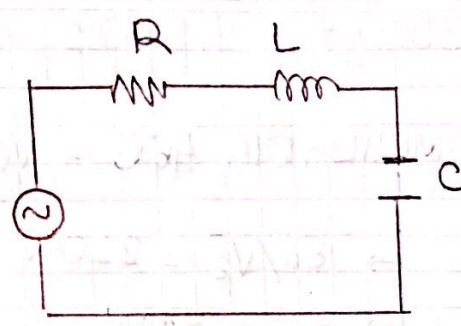
$$Z_L \cdot I = 314,2 e^{j 1,56} \cdot 0,61 e^{-j 0,66} = 191,6 e^{j 0,91}$$

**C.** CALCULAR LA POTENCIA INSTANTANEA.

$$P(t) = V(t) i(t)$$

$$P(t) = 311 \text{ V} \cdot 0,61 e^{-j 0,66} = 190 e^{-j 0,66}$$

2



$L = 0,5 \text{ H}$   
 $R = 300 \ \Omega$   
 $C = 10 \ \mu\text{F}$

$i(t) = 5,2 \cos(100t + 60^\circ)$   
 $\downarrow$   
 $i(t) = 5,2 e^{j\pi/3}$

A - ENCONTRAR LA ECUACION DIFERENCIAL

$V_G = V_R + V_L + V_C$   
 $V_G = IR + \frac{1}{C} \int I dt + L \frac{dI}{dt}$

B - CALCULAR  $V_G(t) = E$  USANDO LA LEY DE OHM GENERALIZADA

$E = IZ_T$

$Z_T = Z_R + Z_L + Z_C$   
 $\cdot Z_R = 300 \ \Omega$   
 $\cdot Z_L = j(0,5 \cdot 100) = 50j$   
 $\cdot Z_C = \frac{1}{j100 \cdot 10 \cdot 10^{-6}} = -1000j$

$Z_T = 300 + 50j - 1000j$   
 $Z_T = 300 - j950$   
 $Z_T = 996,2 e^{-j1,26}$

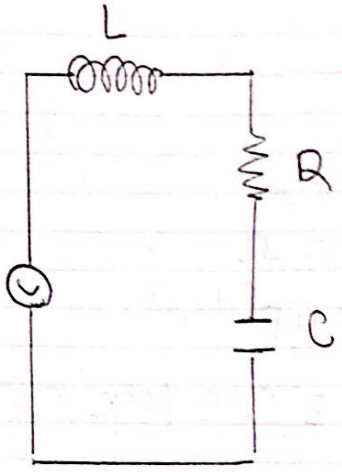
$E = 5,2 e^{j\pi/3} \cdot 996,2 e^{-j1,26} = 5180,2 e^{-j0,21}$   
 $E = 5180,2 e^{-j0,21}$

$V_G(t) = 5180,2 \cos(100t - 0,21)$

C - CALCULAR P(t)

$P(t) = V(t) i(t) = 5180,2 e^{-j0,21} \cdot 5,2 e^{j\pi/3} = 26937 e^{j0,83}$   
 $P(t) = 26937 \cos(100t - 0,21) \cos(100t + 0,83)$

3



$R = 10 \Omega$      $L = 60 \text{ mH} = 0,06$   
 $C = 300 \mu\text{F} = 0,0003$

BED DOMICILIARIA ABG =  $V_G(t)$

$\rightarrow \epsilon_0 / \sqrt{2} = 220 \text{ V}$   
 $\rightarrow \epsilon_0 = 311 \text{ V}$   
 $\rightarrow F = 50 \text{ Hz} \rightarrow \omega = 100\pi$

$V_G = 311 \cos(100\pi t)$

IMPEDANCIA =  $Z$

REACTANCIA  $\rightarrow X = \text{IM}(Z) \begin{cases} > 0 \text{ R.I} \\ < 0 \text{ R.C} \end{cases}$

A- CALCULAR REACTANCIA Y IMPEDANCIA

$I = Z_T$

$Z_T = Z_R + Z_L + Z_C$

$Z_T = R + j\omega L + -j \frac{1}{\omega C}$

$Z_T = 10 + 18,8j - 10,6j = 10 + 8,2j$   
 $= 12,9 e^{j0,68}$   $0,68^\circ$

REACTANCIA  $X = \text{IM}(Z)$

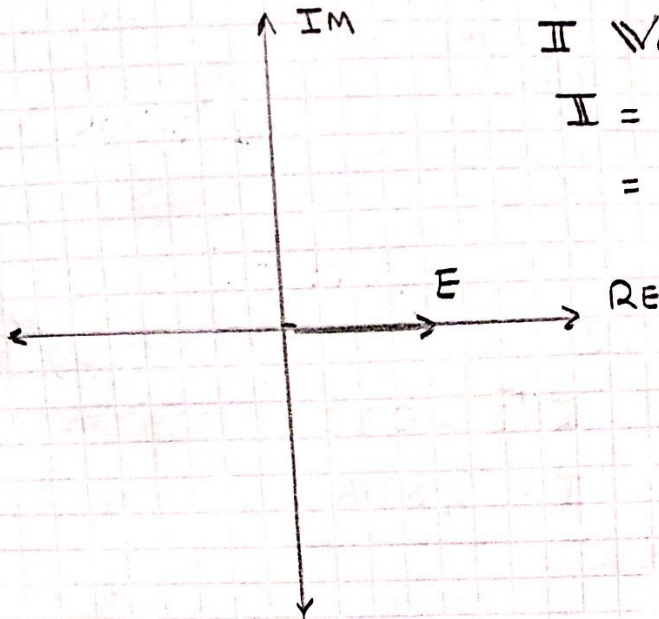
$X = 8,2 > 0$  R. INDUCTIVA

B- CALCULAR  $I, E, V_R, V_L, V_C$

$E = 311 e^{j0} = 311$   
 $Z = 12,9 e^{j0,68}$   $\left\{ \begin{array}{l} E = IZ \rightarrow I = \frac{E}{Z} = 24 e^{j0,68} \end{array} \right.$

$V_R = RI = 241,2 e^{j0,68}$      $V_L = 454,6 e^{j0,88}$   
 $V_C = 256 e^{-j2,25}$

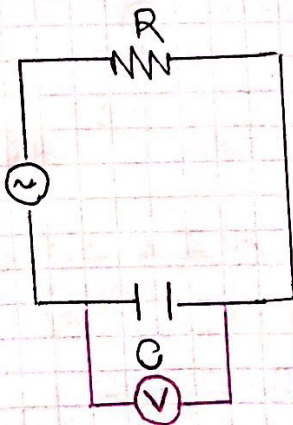
**D- DIAGRAMA FASORIAL**



I	V <sub>C</sub>	V <sub>L</sub>	V <sub>R</sub>	E	φ
I = 0,68	V <sub>C</sub> = -2,25				
=	=				
		V <sub>L</sub> = 0,88			
		V <sub>R</sub> = 0,69			
		E = 0			

**E-  $\omega = \frac{1}{\sqrt{LC}} = 235,7 \text{ Hz}$**

**(4)**



R = 500

V<sub>E</sub> = 311 cos(1000πt)

VOLTIMETRO = 120 V

**A- CALCULAR I**

EL VOLTIMETRO MIDE EL VALOR PICO, NO EL EFICAZ  
ENTONCES PARA ESO  $E_p = \frac{E}{\sqrt{2}} \rightarrow E_p \sqrt{2} = E$

$V_c = 120\sqrt{2} \text{ V}$

NOTA

COMO R Y C SON PERPENDICULARES, PUEDO USAR PITAGORAS

$$V_G^2 = V_R^2 + V_C^2$$

$$(311)^2 = V_R^2 + (120\sqrt{2})^2$$

$$V_R = 260,6 \text{ V}$$

$$V_R = RI$$

$$260,6 \text{ V} = 500 \Omega I$$

$$I = 0,52 \text{ A}$$

$$I\sqrt{2} = 0,52$$

$$I = 0,37 \text{ A.}$$

**B** - LA CAPACIDAD C

$$V_C = -j \frac{1}{\omega C} \cdot I$$

$$|V_C| = |I| |Z_C|$$

$$120\sqrt{2} = 0,52 \cdot \frac{1}{100\pi C}$$

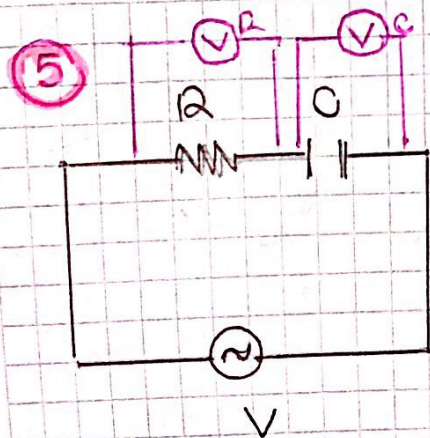
$$C = 9,75 \times 10^{-6} \text{ F}$$

**C-D-E** POTENCIAS P, Q, Y S

$$P = 0,52 \cdot 311 \cdot \cos(\varphi) \rightarrow \text{CUAL?}$$

$$S = 161,72 \text{ W}$$

$$Q = S \sin(\varphi) =$$



$$V = 200 \text{ V} \quad F = 50 \text{ Hz}$$

$$\omega = 2\pi F = 100\pi$$

$$V_R = 150 \text{ V}$$

**A-** CALCULAR  $V_C$

COMO ES UN CIRCUITO RC PUEDO USAR PITAGORAS  
YA QUE EN D.F  $R \perp C$

$$V^2 = V_R^2 + V_C^2$$

$$200^2 = 150^2 + V_C^2$$

$$V_C = 132,3 \text{ V}$$

**B-** RELACION ENTRE  $R$  y  $X_C$

$$\left. \begin{array}{l} V_R = I Z_R \\ V_C = I Z_C \end{array} \right\} \frac{V_R}{V_C} = \frac{Z_R}{Z_C} = \frac{V_R}{V_C} = \frac{R}{-j\omega L}$$

**C-** Si  $I_{EF} = 1 \text{ A}$  CALCULAR  $R$  y  $C$

$$V_R = I R$$

$$150 \text{ V} = 1 \text{ A } R$$

$$R = 150 \Omega$$

$$V_C = I \cdot \frac{1}{\omega C}$$

$$|132,3| = |1 \text{ A}| \left| \frac{1}{100\pi C} \right|$$

$$C = 2,4 \times 10^{-5} \text{ F}$$

**D-** QUE PASA CON  $\cos \varphi$  SI  $R$  AUMENTA

$$\cos \varphi = \frac{R}{|Z|} \rightarrow \cos \varphi = \frac{2R}{|Z|} \text{ AUMENTA}$$